

CLAIMS

What is claimed is:

1. A method for reducing  $\text{SO}_3$  in a combustion process of a sulfur-containing fuel, the method steps comprising:
  - 5 a) partially combusting the fuel in a first stage to create a reducing environment;
  - b) maintaining the reducing environment for a sufficient time period such that  $\text{SO}_3$  is reduced to  $\text{SO}_2$  to achieve a desirable level of  $\text{SO}_3$ ;
  - c) combusting the remainder of the fuel and combustion intermediates in a second stage with oxidizing environment;
  - 10 thereby reducing the levels of  $\text{SO}_3$  in the flue gases.
2. The method of claim 1, further including the step of micro-staging the first stage fuel combustion.
3. The method of claim 2, wherein the micro-staging is provided through the use of low- $\text{NO}_x$  burners.
- 15 4. The method of claim 1, further including the step of macro-staging the first stage of fuel combustion.
5. The method of claim 4, wherein the macro-staging is provided through the use of over-fired air.
6. The method of claim 1, further including a combination of micro-staging and macro-  
20 staging.
7. The method of claim 6, wherein the micro-staging is provided by low- $\text{NO}_x$  burners and the macro-staging is provided by over-fired air.
8. The method of claim 1, wherein the fuel is coal.

9. A combustion furnace operated with a method for controlling  $\text{SO}_3$  in a combustion process of a sulfur-containing fuel, the method steps comprising:

a) partially combusting the fuel to create a reducing environment;

b) maintaining the reducing environment for a sufficient period such that  $\text{SO}_3$  is reduced to  $\text{SO}_2$

5 to achieve a desirable level of  $\text{SO}_3$ ;

c) combusting the remainder of the fuel in an oxidizing environment;

thereby reducing the conversion of levels of  $\text{SO}_3$  in the flue gases.

10. The method of claim 9, further including the step of micro-staging the first stage fuel combustion.

10 11. The method of claim 10, wherein the micro-staging is provided through the use of low- $\text{NO}_x$  burners.

12. The method of claim 9, further including the step of macro-staging the first stage of fuel combustion.

13. The method of claim 12, wherein the macro-staging is provided through the use of over-  
15 fired air.

14. The method of claim 9, further including a combination of micro-staging and macro-staging.

15. The method of claim 14, wherein the micro-staging is provided by low- $\text{NO}_x$  burners and the macro-staging is provided by over-fired air.

20 16. The method of claim 9, wherein the fuel is coal

17. A method for controlling  $\text{SO}_3$  concentrations in a combustion process of a sulfur-containing fuel, the method steps comprising:

a) partially combusting the fuel in a first stage to create a reducing environment;

b) adjusting the reducing environment time period such that  $\text{SO}_3$  is preferentially reduced to  $\text{SO}_2$  to achieve a desirable level of  $\text{SO}_3$ ;

c) combusting the remainder of the fuel and combustion intermediates in a second stage with oxidizing environment;

5 thereby controlling the levels of  $\text{SO}_3$  in the flue gases.

18. The method of claim 17, further including the step of micro-staging the first stage fuel combustion.

19. The method of claim 18, wherein the micro-staging is provided through the use of low- $\text{NO}_x$  burners.

10 20. The method of claim 17, further including the step of macro-staging the first stage of fuel combustion.

21. The method of claim 20, wherein the macro-staging is provided through the use of over-fired air.

15 22. The method of claim 17, further including a combination of micro-staging and macro-staging.

23. The method of claim 22, wherein the micro-staging is provided by low- $\text{NO}_x$  burners and the macro-staging is provided by over-fired air.

24. The method of claim 17, wherein the fuel is coal.